UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

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BRANCH OF RESEARCH

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ALLEGHENY FOREST EXPERIMENT STATION

General

Hough made a brief visit to the Appalachian Station and the Bent Creek experimental area in order to discuss on the ground methods of cruising and general administrative methods. Approval of the transfer on June 1 of Assistant Forest Ranger P. E. Ackerman to the position of resident superintendent of the Kane Experimental Forest has made it possible for us to plan on equipping this field station at once. The Weather Bureau has consented to make it an official station, and the simple apparatus furnished by the Bureau will be supplemented by our own instruments for much more intensive observations.

Land utilization was the foremost topic under discussion by the Directors of the Northeastern Experiment Stations in annual conference at New York; the place of forestry in any intelligent program of land use is very fully recognized in this conference. Among the many administrative problems profitably discussed was the question of dividing the several aspects of a single project, such as chemical or soils, among different departments of an experiment station, as opposed to organizing around the project, and attaching the necessary chemists and soil experts to its personnel. The project method of organization seemed to be most favored. Emphasis was laid on the danger of undertaking, or at least publishing upon, biological studies cast in an economic form. "Does it pay to fertilize potatoes with bone meal?" is an example. Particularly in these days of rapid change in economic conditions, it was pronounced best to confine such a study to the effect of the fertilizer on the potatoes, leaving to the county agricultural agent or the individual farmer himself the decision as to whether the results achieved are justified by the expense at any particular time. Mixing economics with biology sometimes leads to serious misunderstanding.

This bears on the question recently asked the Forest Service directors as to the possibility of closer cooperation between the Branches of Public Relations and of Research. Although there is always need for tempering silviculture with economics, we question whether the results of silvical research can be successfully placed directly in the hands of the ultimate consumer - the owner of forest land - without so much discussion of economics as to make the publication a hopeless hodge-podge. Forbes has come to the conclusion that our first duty is to publish research results in a form thoroughly understandable to the average practicing forester, but not necessarily in a form intelligible to the layman. Unless interpreted by a forester, information derived from research may be sadly misapplied to specific tracts. Mr. A. C. McIntyre of Pennsylvania State College, joint author with Schnur of a bulletin on the measurement of mine props, has told us that this bulletin has been in great demand among those attending extension meetings, after the contents of the bulletin had been verbally explained by one of the extension forestry specialists of the state. Did the Branch really accomplish what the Forester expected

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us to accomplish by its very wide distribution of the mildly technical publications in the timber growing series? The same bulletins, pushed for distribution through district foresters in the several states, county agents, and similar officials, stand a much greater chance of being read and used than when simply mailed to forest landowners. In these times of curtailed printing funds this is worth considering.

The number of cards in the author and subject files of the Station library has now risen to approximately 13,000. Publications covered include the Forest Quarterly and the Journal of Forestry complete; Ecology from 1920; the Journal of Botany, the Monthly Weather Review, Soil Science, the Journal of Agricultural Research, and the Scientific Monthly, from 1928; the Library of Congress cards covering forestry both here and abroad from 1910; and miscellaneous leaflets, Service news letters, and similar publications from 1928. There are 487 bound books on our shelves. Miss Skamser is very largely responsible for what we believe to be this excellent showing.

Forestation

This year's plantings of white, loblolly, and Norway pines have completed the job of underplanting, or rather interplanting, planned for the Camp Ockanickon tract. There were 960 replacements, and 1100 new plantings. Rabbit damage since November has been extremely variable. No species has been exempt, and some have suffered very severely. The 1931 planting of Norway pine was hard hit, while the 1930 plantation was practically undamaged, although located next to the white pine plantation of the same year, which was badly damaged. A half-acre cleared of native vegetation a year or two ago by the Bureau of Plant Industry for planting to foreign chestnuts, was appropriated by us after all the chestnuts died. It has now been surrounded by a rabbit-proof fence, and planted to pines, in our first satisfactory test of the relative adaptability of white, Norway, and loblolly to cleared sites in south Jersey. Of the few trees planted in this area before the fence was completed, the loblolly pine suffered heavily from rabbits, the white pine slightly, and the Norway pine not at all. Last winter the young oak sprouts were very generally girdled. In the absence of a zoologist, we can only speculate, sometimes profanely, as to the causes behind vagaries in the rabbits' appetites.

Management

In his study of moisture relationships at Camp Ockanickon, Wood plans to set up four additional rain gauges to determine the effectiveness of rain falling through canopies of varying density. He has made a crown canopy map for the stand surrounding the headquarters' building, as a guide in placing the gauges. He is continuing on a considerable scale his sampling of soil moisture. Jackson and Doak visited Camp Ockanickon to examine oak seedlings for root-rot. Seedlings from acorns planted in several beds last fall, and a few germinating under natural conditions outside, were studied. Dr. Yocum reports from Washington that black oak in unmulched beds suffered from winter killing, even in the past mild winter; so far Wood has discovered no such killing in his mulched beds.

Mr. L. L. Lee of the New Jersey Agricultural Experiment Station visited the Station to discuss with Wood the extremely devaized data which Wood had prepared for him on forest composition at Camp Ockanickon as related to the soil types of Lee's map of the tract. Owing to the diversity of soil types, and of forest age classes, the data seem insufficient to prove anything very conclusively. Because any considerable collection of additional stand data would require time that Wood can ill spare from his other work, it is improbable that we can proceed on the proposed joint paper by these two men. Unquestionably the time to make the soil observations in a study of this kind is when the stand data are being collected.

Mensuration

From Washington Schnur reports having made a grand average diameter distribution for all the loblolly pine plots having a crown density of .7 or better. There are 111 of these, counting re-measurements at 5-year intervals. By computing for each plot the percentage of the total number of trees in one-half standard deviation classes, he is enabled to compare all of the plots, and to combine them in a single distribution. He found that Glover and Carver's curve, using only the third moment or skewness correction, fits this distribution better and is more easily computed, than Charlier's A or B type curves. Completion of this job has enabled him to begin his manuscript on diameter distribution and stand tables of loblolly pine in Maryland. He has also begun a study of mortality in the same loblolly pine sample plots.

Schnur's article on converting factors was finally sent to the Journal of Forestry. A shortened version of Hough's paper on diameter distribution of white pine was re-submitted to the Journal. The editor, who two years ago was somewhat alarmed by the scarcity of material for his periodical, now reports that he is almost overwhelmed, and is forced to ask that all papers submitted be as short as possible. It would be interesting to know how far the development of the Federal experiment stations is contributing to this situation.

Protection - mycorrhiza

Hatch spent about half his time assisting Dr. Doak in the examination and permanent preservation of the material obtained in the 1931 survey, and the remainder on his pure culture work at the Boyce Thompson Institute. Doak has begun in the University greenhouse a series of pure culture experiments with ingeniously arranged and comparatively inexpensive apparatus. Pitch pine is giving particularly satisfactory results in these experiments, being vigorous and uniform in growth. Doak is inoculating some of these seedlings, as well as seedlings of other coniferous species, with fungi suspected of forming mycorrhiza. Over 30 such fungi were collected in the Station territory in 1931, and raised in pure culture for these syntheses.

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Loblolly Pine - increased growth following partial cutting.

MacKinney continued the analysis of increased growth following partial cutting in loblolly pine. After many attempts to set up a method of estimating increase in growth the conclusion has been reached that this cannot be done with the present data (1462 trees) because of (1) the multiplicity of factors which are operative in causing increase and (2) because of the inability to set up any satisfactory method of evaluating competition before cutting and release after cutting. In the sample of these trees studied, diameter, height, crown ration, and crown width at the time of cutting appear to have the most effect on increase in growth. It was also suggested from one phase of the analysis that the effect of at least some of these factors varied with the amount of release and with the amount of competition to which the individual trees were subjected prior to cutting.

Change in form following partial cutting was considered for 35 trees which had been cut at Smithfield, Va. In this work it was found that the change in form factor due to partial cutting (i.e., change in form factor in addition to the change likely to have occurred had there been no cutting) was associated very slightly with changes in form factor at the time of cutting for trees of the same diameter and height. Trees with large diameters showed a tendency to have less change in form factor than trees of the same height with small diameters. Form factors of tall trees showed greater changes than those of short trees of the same diameter. These findings will be checked with 50 other trees from different localities.

Fire weather

Pierce has developed a tentative layout of fire weather reporting stations, after having made studies of fire and rainfall distribution. The area covered includes western North Carolina and South Carolina, northern Georgia, eastern Tennessee, and southwestern Virginia. Mr. Pierce is cooperating with the Station in the conduct of studies relative to variations in temperature and humidity between representative north and south slope locations at Bent Creek.

In order to arrange practical cooperation in the fire weather work, a meeting of national forest supervisors, called by Supervisor Mattoon of the Pisgah, was held on April 12. The Unaka, Cherokee, Nantahala, and Pisgah National Forests, the Smoky Mountain National Park, and the Appalachian Station were represented. A working basis was reached for preliminary weather reports.

Biology (Biological Survey)

Burleigh continued the trapping of rodents on the Bent Creek experimental forest through the first half of the month. Results showed large numbers and continued breeding throughout the mild winter.

During a trip to the Great Smoky Mountains Burleigh was able to secure seven specimens of Microtus crotorrhinus carolinensis, a form of meadow mouse apparently peculiar to the Smokies and but recently described by E. V. Romarek of Chicago.

Some time was spent tracing the five beaver which were liberated near Asheville last winter. The beaver are proving quite a problem, but are seemingly coming to no harm despite their restlessness and tendency to explore all the streams in this vicinity.

Fire damage

Nelson and Sims tentatively laid out, on the Bent Creek experimental forest, a 20-acre area to be burned over in the fall. A check area has been tentatively selected. A 25 per cent cruise showed an uneven-aged mixed oak stand varying from a predominance of white oak to a predominance of chestnut oak with considerable scarlet and black oak throughout. Another area, in a young even-aged stand, chiefly of hardwoods, is also being considered. It is proposed to do as much as possible of the preliminary work - such as the survey, mapping, tree measurement, and tagging of the sample plots - during May and June.

Streamflow and erosion

Hursh spent the entire month in the field, mainly in the vicinity of Bent Creek experimental forest, surveying opportunities for studying the significance of different types of forest cover on excessive runoff.

Observations show that grazing on old field land on which a new vegetation cover is appearing results generally in increased erosion. Adjacent fields, abandoned for five years, one grazed and the other ungrazed, show a practical protection of broomsedge and briers on the ungrazed area and serious sheet erosion and gullying on the grazed.

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Forest Management - Pine Region

A brief field sortie on the Plumas was necessary to permit subdivision of the 8 Mc plots at Massack for analysis. This check survey and tally revealed some sketchy surveying done at the time of plot establishment 20 years ago. This poor original work caused much delay and additional expense, not only in the present field work but also necessitates corrections of voluminous office records because of erroneous area factors. The moral is that carelessness in the layout of permanent plots should not be tolerated. Poor surveys are often the result of using a compass but a transit was used in this case.

Suitable instruments for natural reproduction studies are apparently difficult to obtain. Ecologists do not seem to have met our requirements for registering soil thermometers and soil thermographs particularly. Not satisfied with instruments used last season a request for information was broadcast to prominent ecologists and other users of such instruments. The results were nearly negative or minus - if one includes veiled suggestions of doubt about "our" intelligence. Why should one want a soil thermograph registering 0° to 200° F.? We have also been advised that a thermograph bulb 1/8 inch in diameter would have to be 18 feet long and possibly 200 feet! With considerable trepidation specifications have been prepared which instrument makers say are reasonable. At the end of this season we may know only more about instruments instead of more about seedling survival. Any one willing to take a chance may have a copy of the specifications.

Forest Management - Redwood

We plan to continue the use of the milacre quadrat as our unit for sampling cut-over areas in spite of all the support that has been given the 13.2 foot square by Regions 1 and 6. We believe that the 13.2 foot unit is too large for sampling reproduction under 20 years of age. The supporters of the 13.2 foot unit apparently do not believe that 165 to 250 young seedlings constitute good stocking and they support the larger unit by evidence to prove that where there is one tree to a unit there are more. Mr. Cowlin of Region 6 (See article in Journal of Forestry, April issue) found that on a number of sample quadrats there was an average of 5.3 trees on every stocked square. It might be argued that the average number of trees found on quadrats scattered over 284 miles of strip is of less importance in determining the stocking on a particular area, than the percentage of cases with one, two, three, four, or more trees per 13.2 foot square. With an average of 5.3 trees per unit there might be considerable areas where a high percentage of the plots had only one tree, balanced with other areas having a high percentage of plots with 11 or more trees per plot.

But even if we assume that there are 5.3 trees on every 13.2 foot square, does that necessarily mean complete stocking? There are four milacre quadrats in each 13.2 foot square and there should be considerable difference in the stocking of two areas, one of which has one tree or more to each milacre quadrat, whereas the other has all of the trees in only one of the four milacre quadrats.

The stocked quadrat method of sampling is based on the theory that the distribution of trees is more important than the number of trees. If we use this method, what excuse is there for using a unit that is too large for young reproduction and then trying to justify it on the basis of the number of trees found. It seems more important to know what per cent of the milacre quadrats, in a 13.2 foot square, are stocked with one or more trees, than to know the actual number of trees in the plot. As a part of our study of cut-over areas of the redwood region records from 2,146, 13.2 foot plots, were taken so that it was possible to show what percentage of the stocked 13.2 foot plots had 1, 2, 3, and 4 of its milacre quadrats stocked. The following table summarizes the results:

No. of stocked milacre quadrats in a 13.2 ft. plot	No. of stocked plots (13.2 ft.)	Per cent of total No. of plots
1	330	52.9
2	152	24.4
3	79	12.7
4	62	10.0
	623	

This shows that in the areas covered by this survey over one-half of the stocked 13.2 ft. squares had no trees in three of the four quadrats. If there were 5.3 trees in each of 13.2 ft. squares there was better than an even chance that they would all be in one-quarter of the plot. In 77 per cent of the plots there would be either two or three milacre quadrats with no seedlings.

The whole question of size of sampling unit for determining the stocking of cut-over areas is of enough importance at this time to warrant a thorough study of this question which would serve as a basis for standardizing the practice in the different Regions so far as this is practical. A big advantage of the small unit is that it makes possible combinations of larger size if found desirable. If the unit used is found to be too large it cannot be broken down later.

Forestation

At Berkeley the cooperative experiment between the Station and the University Division of Plant Nutrition in raising coniferous seedlings in nutrient solution reservoirs has shown some spectacular results. For example, the germination of southern California sugar pine in the nutrient

solution reservoir was four times as high as in the soil seedbed; although the same species from northern California showed only 1 per cent better germination in the solution than in soil. For Jeffrey pine, both northern and southern seeds showed a germination rate in solution approximately twice the rate in soil. Ponderosa pine, north, showed 1 per cent higher in solution, and the same species, south, 5.5 per cent lower germination than in soil.

It has recently, however, exhibited losses among the sugar pine sections to such an extent that expert consultation was deemed advisable. Accordingly, an examination was made by Dr. E. P. Meinecke in company with Doctor Gericke, "the plant-food-pill man," and Kraebel.

The subject of greatest concern was the shriveling and unhealthy appearance of the root systems of many of the plants in solution. In view of the comparatively slight amount of damping-off, it seemed probable that the trouble was the result of the continued presence of nutrient solutions beyond the needs of the plants. The germinating sugar pine exhibited all the characteristic malformations of the species which result principally from arrested development at various stages of emergence of the cotyledons from the seed-coat. To correct the matter the nutrient solutions were drawn off and the reservoirs refilled with fresh water. This procedure conforms to Gericke's practice in growing cereals. Its results will be closely watched.

Cover Types

The end of April finds field work nearly completed in the South Coast Range Mountains situated within Kern, Kings, Fresno, San Luis Obispo, Monterey, and San Benito counties. Since November of last year nearly 4,000,000 acres have been mapped in this region. Containing large areas of public domain, it was to be expected that the vegetation has been seriously deteriorated by fire and overgrazing. Evidences of accelerated erosion are to be found on all sides and some striking photographs illustrative of this were secured. The predominant types are grass, grassy woodland, chaparral, and sagebrush, the last named being to a large extent former grassland deteriorated by overgrazing.

Erosion and Streamflow

Watershed Studies

The Y watershed in Devil Canyon is being studied to measure the streamflow loss during growing seasons occasioned by stream-side vegetation of alders and similar mesophytic vegetation. Stream-flow measurements for the rainy season were made to determine the storm run-off coefficients. During the month the instruments were adjusted to the spring and summer flow. As the alders in the canyon floor began to leaf out diurnal oscillations of water flow began to show on the recording charts, and at the end of April the oscillation is quite striking.

A special type of flow meter has been developed by C. A. Taylor of the Bureau of Agricultural Engineering cooperating with the California Forest Experiment Station in this study. It has become a heavy burden to calculate the hourly flow from the three-stage recorder charts to determine the diurnal losses occurring between three controls. Accordingly, a cam was designed by Taylor and Nickle which integrates the stage height into flow direct, so that one flow curve from one control may be placed over another from its control, on a light-table and the space between the two curves planimetered. This will give differences in flow in cubic feet direct. Labor saving devices are in demand in research in contrast to the industrial world at the present time. It is necessary to construct a large float 30 inches in diameter to give the flow meter the desired sensitivity to changes in stage height. The flow meters have been installed at three controls.

Testing Water Measuring Instruments

In Y watershed, three water measuring devices have been set up in series to measure water in terms of each instrument. They are

1. The simple stage recording chart from a 3-inch Parshall flume, Ontario model.

2. Flow meter recording chart from a 3-inch Parshall flume, Ontario model.

3. Tipping bucket of 0.5 cubic foot capacity at each tip.

The tipping bucket is being given a rigid test for cleaning in currents moving heavy bed load material. Likewise the instrument is to be calibrated for flows moving different amounts of bed load material per minute. The tests of this instrument will determine the design and installation of the large tipping bucket at Barranca Burn for next year.

Triplicate Watersheds

A geological map has been prepared of the structure and petrology of the portion of San Dimas Canyon where the tentatively selected triplicate watersheds lie. The mapping was done by Berry and Snedden under the direction of Professor Woodford of the Pomona College Geological Department. The report discloses that the country rock is quartz diorite gneiss, into which dykes of aplite and pegmatite were intruded prior to recent geological times. Since the dykes are continuous, showing no off-sets, it is assumed that faults have not affected this particular section since the intrusion. Two land slips, however, were found to have occurred in the vicinity but do not affect the selected watersheds. Thus the geological report is favorable for the selection of these watersheds in Fern Canyon of San Dimas with respect to uniformity of structural and petrological features.

Development of Test Smoke

For years, test smokes have been recognized as a means of checking the alertness of lookout men. The dangers attendant upon starting small fires have limited the use of this very effective method. In 1931 preliminary experiments were inaugurated on the Shasta Experimental Forest for the purpose of providing the administrative force with a simple, safe, and usable means of producing realistic smoke columns.

Fuels of various kinds were ignited, singly and in combination, and the character and volume of the smoke produced was noted. Chemicals were injected into the flame or heat column in an effort to secure a smoke comparable to that of a small Class A fire. Due to a deficiency in some quality (volume, proper color, density, or ability to rise), all except two smoke producing agents were rejected for the time being. Smoke candles recommended and used by Mr. McArdle, in his radius of vision studies in Region 6, together with natural fuels lighted in a special burner, gave suitable smokes both from the standpoint of appearance and action.

The smoke candles, small cylinders (1" x 9"), provided with a fuse, are manufactured by the Hitt Fireworks Company of Seattle. The formula for the combustible contents are the secret of the manufacturer. A conical Sibley stove, with ten feet of stovepipe and a damper was used as the combustion chamber. To provide suitable draft to start convection currents, it was necessary to raise the bottom of the stove about an inch from the ground on blocks.

The smoke from natural fuels was produced in a burner made from a galvanized ash can 18" x 25". One inch draft holes were cut in the sides at two inches from the bottom and about six inches apart around the circumference, screened to prevent the escape of sparks. For these tests newspaper was crumpled up and ignited in the bottom of the can. Green conifer boughs, brush or bracken fern packed loosely on top of the flames produced a good smoke. The use of a hood and pipe would give a more definite body to a smoke to be used for lookout checking.

Simultaneous tests were run to secure a comparison between the two above methods of producing smoke. Smokes were started at distances of from two to nine miles from a lookout point occupied by the observer. The relative ease of discovery was noted and recorded. In addition a rating of the vanishing point was secured by interposing in the line of sight regularly graduated neutral density filters, and recording the density rating of the filter which eliminated the smoke from sight. These ratings give a good picture of the relative visibility of the smokes for the different methods of smoke production as well as for the different distances used.

On a day when visibility conditions were fair, single candle smokes were readily seen at distances up to six miles and were visible at nine miles. Two candles and the fuel burner smokes were readily visible at nine miles, the farthest distance used. Variations in the degree of visibility occurred at some of the intermediate distances. It was evident that a number of factors other than the distance of a given smoke from a lookout, influence its visibility. More specifically these factors are the color of the background against which the smoke column appears, the location of the smoke with respect to sunlight and shadow, the angle at which the sun hits the smoke, and the wind velocity at the time. Light backgrounds render good smokes invisible even at short distances; dark backgrounds, such as heavy timber, allow smokes to be plainly seen at the upper range of distance. A smoke of a given size in full or partial sunlight is more visible than a like smoke in shadow, as in a ravine or the shady side of a ridge. Full sunlight shining obliquely on a smoke, from the right or left of the line of sight of the observer, gives the smoke added visibility. The volume of a test smoke is relatively small, and a wind of four or five miles an hour causes the smoke to disperse before it can assume sufficient body to be readily visible. These effects, singly or in combination, might easily outweigh the effect of distance on visibility. Additional observations will be carried on to supplement and verify the preliminary conclusions set forth above.

In order to secure comparable results and to be entirely fair to the lookout man, the administrator who plans on checking lookout alertness by using test smokes should observe the following general rules:

1. Use the same number of candles or amount of fuel for a given distance. It may be necessary to use only 1 candle at 3 miles but 2 at 10 miles and 4 at 15 miles. The same applies to the amount of fuel and method of arranging it in the fuel burner.

2. Select days of fair visibility for tests.

3. Select locations sheltered from the wind or a time of day when it is calm.

4. Select locations from which the lookout station can be seen, especially in timbered country.

5. Select locations such that the column of smoke will have a dark background of timber or brush. Avoid, if possible, grey and light brown or other light colored backgrounds such as rock slides, dry grass sage, etc.

6. Avoid locations which are in deep shadow, when setting off the smoke.

Products

Logging and Milling Study

There were some decidedly startling results from the Stanislaus Study. The most startling, perhaps, was that a margin of over $18.00 per M.B.M. for stumpage and profit could have been obtained from the plot by cutting only the trees 52" and over in D.B.H. Clear cutting to 12" D.B.H., inclusive, yielded a margin of about one-half that amount. This area was a site I "cream" area, so that these results do not guarantee an operator such average returns. They are valuable as showing the relation between methods of cutting as affecting values.

White Fir Mill and Depreciation Study

The study at Susanville was so conducted last fall, that surfaced boards could be traced back to the log and tree from which they were sawed. The log sizes ranged from 10" to 37" with a really adequate representation of sizes from 12" to 29" only. 67 per cent of the logs were graded in log grade 3, the lowest log grade. The results of the Susanville study failed to show any significant relationship between log size and board degrade which would justify the added expense of securing this information.

For the narrow range of log sizes in this study, a much more important factor was found to be the manner in which the log was sawed, and whether the board was cut from the heart or the side of the log. Thus, whether a particular board is sawed from a large or small log, or a knotty or surface clear log, is overshadowed by the more important factor of from what part of the log it is cut. In pine, for instance, the boards cut from the side of the log would usually be graded into shop and upper grades, while the center cut boards would go into 3 shop or low grade common.

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CENTRAL STATES FOREST EXPERIMENT STATION

Forest Litter Project

Dr. Auten's work on base exchange and readily soluble calcium and magnesium of forest soils compared with cultivated soils demonstrates the great loss of these bases that occurs when litter-covered forest soils are cleared, cultivated, and subjected to leaching and erosion. The soil fertility developed and held under forest cover accounts for the large yields of agricultural crops on newly cleared lands; its early loss on hilly lands explains in part the prevalent land abandonment.

Dr. Auten's investigation involves some 23 old-growth forest sites in Ohio, Indiana, Michigan, and Illinois. One typical example will serve to illustrate the results. On a Clermont silt loam soil in southern Indiana, there were found to be 4,700 pounds of base-exchange calcium per acre in the upper six inches of forest covered soil, and only 2,200 pounds per acre in the same soil horizon of an adjacent cultivated field. From a soil originally of poor fertility, 2,500 pounds of lime per acre have been lost through cultivation, leaching, and erosion.

The leaf litter added to an acre of this forest annually carries down less than 100 pounds of calcium. If all this calcium in the leaves were allowed to remain in the surface soil, and if the annual supply of calcium for new tree growth were obtained from lower soil depths, it would require at least 25 years of forest cover to return to this soil the calcium lost through cultivation. However, since the calcium for new growth is drawn largely from the surface soil, much of it is used as rapidly as it accumulates, so that to return the original calcium content through forest cover would require, at a conservative estimate, more than 100 years.

Great emphasis has been placed in recent years on the necessity for liming agricultural lands. Auten's work is demonstrating that a crop of forest trees will gather and spread the lime necessary to return fertility to abandoned field soils, while producing profitable forest products.

Chestnut Oak Regeneration Study

Remeasurements of plots on the Clark County State Forest in Indiana, showing the establishment and survival of chestnut oak seedlings from the 1928 seed crop, were made during April by Kuenzel and Day. Observations have been made annually since the plots were established in 1929. Records from the 50 permanent milacre quadrats on clear cut, partially cut, and uncut check plots, revealed further differences in the development of seedlings as affected by depth of litter and amount of cutting. On the clear cut and partially cut plots oak galls were much in evidence on seedlings, particularly on areas where all trees had been removed. Seedling sprouts were not so affected. The latter were present in greatest numbers on the clear cut and thinned plots, while seedlings existed in greatest numbers on the check area where no cutting had been made. Drought and rodent mortality continued to reduce the total amount of reproduction. Most favorable growth of seedlings was noted on quadrats having leaf litter 2.0 inches and over in depth. In general, on these plots seedlings showed greater average height than did seedling sprouts, although individual sprouts exceeded seedlings in rate of growth. Stump sprouts from the 1928 cutting were several times the height of seedlings and seedling sprouts. Further analysis of the data is being made.

Woodland Grazing Project

Day spent the last week in April at the Pinney-Purdue Farm at Wanatah, Indiana, in preparation for the continuation of the carrying capacity study which was initiated last year in cooperation with the Purdue Agricultural Experiment Station. Several suggestions made by Chapline will be incorporated in the plans for this year, including two additional quadrats in the 18-acre pasture, and a cover type map for the entire woods.

Vegetation is unusually late this year in northern Indiana, in spite of the open winter, and on May 1 there was practically no forage available in the woods and very little in the open pastures in the vicinity. For this reason the stock are not being turned out on May 1 as planned, but will be kept on soy bean hay until May 7, or later if necessary. The livestock to be used in this year's experiment are Angus yearling steers. They average about 800 pounds in weight, and are more uniform in size and grade than were those used last year.

Locust Borer Investigation

Dr. Hall spent April chiefly in compilation of sample plot material, preparation of plot forms, copying plot maps, and general administrative duties. He made a field trip to determine the seasonal activity of locust borers. In southern Ohio the larvae have been active for some time, but in the northern part of the State very little activity was in evidence. Collections have also been made of insects working on the native pines of Ohio.

Phenological Observations

Although in general throughout the Central States the past winter has been exceptionally warm and open, the recent cool weather during April has served to check vegetation. Mr. Charles Guernsey, of the Clark County State Forest in southern Indiana, states that the 1932 season is two weeks behind 1931. In northern Indiana (Wanatah) Day reports that the vegetation appears to be even more retarded. On April 20, 1931, all trees were in leaf except the black oaks, whereas on April 27 of this year, black cherry and trembling aspen were the only species which had started to leaf out. Red bud was in blossom at Henryville, Indiana on April 18, but had not blossomed at Valparaiso on May 1. At Henryville yellow poplar started to leaf out on April 21, chestnut oak buds started to break on April 20. Shagbark hickory buds burst on April 18 and pignut hickory on April 21.

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NORTHEASTERN FOREST EXPERIMENT STATION

Early in April official announcement was made of the forthcoming transfer of our headquarters to New Haven, Conn. Through the efforts of the School of Forestry, the Plant Science Division of Yale University is making available to us the buildings situated in the Farnum Botanical Garden. The main building which will house the staff has about 20 rooms. These, with very little alteration, are admirably suited for office rooms. A garage of about 8 car capacity will take care of that phase of the housing problem. Yale University is going to considerable expense in renovating the heating plant of the Farnum house and in adding additional electrical equipment. With the interior of the building largely redecorated by the middle of June, when the general exodus from Amherst will take place, plus the beautifully maintained grounds of the Botanical Garden surrounding the building, the Station will have truly palatial quarters.

The Station is making an attempt to develop more specific definition for the various forest types recognized by the Society of American Foresters Type Classification Committee as occurring in the northeastern region. As a starter in this respect, Westveld analyzed a number of stand table tallies obtained in the "yellow birch-red spruce" and "red spruce-sugar maple-beech" types. These are two extensive types of considerable commercial importance in the spruce region. For these types the following definitions based on stand composition have been evolved:

Yellow birch-red spruce type

Conifers usually comprise over 40 per cent of the stand with red spruce and balsam fir about equally represented. Yellow birch is usually the predominant species and greatly exceeds the combined numbers of all other hardwoods present in the stand. It may comprise from 25 per cent to more than 50 per cent of the stand. Sugar maple seldom comprises over 5 per cent of the stand.

Red spruce-sugar maple-beech type

Conifers comprise from 25 to 45 per cent of the stand with red spruce usually more abundant than balsam fir. Sugar maple and beech combined usually exceed the number of yellow birch by a good margin. Sugar maple usually comprises over 10 per cent of the stand.

In order to determine whether the composition of the understory differed to any great extent from the overstory, two stand tables were compiled for each type. One table was for the stand 6" d.b.h. and above and the other for the stand from 1 to 5" d.b.h. inclusive. An analysis of the tables indicated that the definitions given above may be expected to apply either to the main stand or the understory.

During the month Stickel supplied sets of his Petersham fire-weather alinement charts to all the state forestry departments of the region. Comments from several of the state foresters indicate that such charts appear to be the form in which fire-weather data are readily appreciated by the field men. Although the alinement charts were made specifically for estimating the moisture content of white pine duff, they likewise give a fair indication of the moisture conditions of mixed pine-hardwood litter. This point is illustrated by the following records of duff moisture estimates and forest fires of the mixed forest of Connecticut supplied by Mr. Hawes, State Forester of Connecticut.

Date	Time	Hours since last rain	Air Temp.	Rel. Hum.	Estimated surface duff moisture in Open	Forest	Hazard	Number of Fires
Apr. 21	11 a.m.	216	64	43	8	28	Extreme	
	2 p.m.	219	72	31	5	16	"	20
	5 p.m.	222	73	32	4	11	"	
Apr. 22	11 a.m.	240	68	24	5	21	"	14
	2 p.m.	243	69	21	3	11	"	
	5 p.m.	246	74	29	4	11	"	
Apr. 23	11 a.m.	264	62	24	5	21	"	
	2 p.m.	267	56	16	5	16	"	25
	5 p.m.	270	54	17	4	11	"	
Apr. 24	11 a.m.	288	51	34	6	24	"	
	2 p.m.	291	52	19	7	21	"	17
	5 p.m.	294	55	28	6	16	"	

Assisted by Behre, Tillotson, Westveld, and Jensen, Stickel tested the suitability of Fire Dust for forest fire control work. Tests with this chemical were made on grass fires having a fifty-foot front. The Dust was applied to the flames with a portable dusting machine having a metal delivery tube about 4 feet long. In the opinion of those present during the experiment the extinguishing effects of the chemical were entirely negative. It only momentarily extinguished combustion at the place being treated and did not prevent the occurrence of flare-backs. Fine soil appeared to have as good an effect or better than the chemical. Water was far superior to Fire Dust both in effectiveness and speed.

Growth data obtained during the 1931 survey of the Bartlett Experimental Forest were analyzed statistically to determine their variability. The results will be of value in the management-plan timber survey being made by the White Mountain Forest, serving as a guide to the number of increment borings needed for a given degree of accuracy in growth data. Data were too scanty for most types to permit differentiation by type.

The diameters involved for most species were small; additional data, with larger diameters, from last year's work of the timber-survey crew are being analyzed in a similar manner.

The following table gives the results. "Variance" is the standard deviation expressed as a percentage of the mean.

Species	Basis - No. of 5-yr. periods (Two per tree	Av. 5-yr. radial growth - inches	Variance	No. required for 10% max. limit of error (P.E. approx. 2.5%)	Range in d.b.h.	No. required per 1" d.b.h. class
Sugar maple	122	.229	53.4%	256	1.9-9.9	32
Red maple	246	.271	49.3	218	1.6-10.4	25
Beech	207	.239	55.5	278	2.0-10.5	33
Yellow Birch	192	.198	62.2	348	2.2-10.5	42
Paper birch	142	.323	42.2	161	2.1-10.2	20
Eastern hemlock	207	.234	66.2	395	1.8-23.0	19
Northern white pine	114	.416	62.9	356	1.6-21.5	18
Red spruce	174	.199	81.5	599	1.6-15.0	45
Balsam fir	148	.219	70.2	443	1.8-14.2	36

The compilation of the data collected during 1931 at the three weather stations on the Bartlett Experimental Forest was completed in April. Conditions were very similar at the two forest stations, one of which was located on an area where a heavy cutting will be made during the present field season.

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NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Fire Protection and Transportation Planning

On April 28 and 29 the tentatively completed Clearwater plan was reviewed by Regional Forester Kelley and his staff.

The proposed plan shows an average annual cost of fire control expense plus damage that is well within the Forester's limitation of average P+S+D for the past eight years. The proposed saving is greater if the Clearwater is allowed the average history of the white pine group of Forests (Clearwater, Coeur d'Alene, Kaniksu, St. Joe) than on its own history alone. This is due to the fact that the item of damage exercises a large influence in the total cost of P+S+D. The Clearwater has not been burning green timber during the past eight years, while the Kaniksu burned a very large amount of it. Probably an eight-year period on one Forest is too short for historical purposes. If the Clearwater history is extended back to 1919, 1914, and 1910, the damage value will include large burns in green timber.

Measuring Fire Danger

Duff hygrometers were installed at stations that are most likely to show early fire danger on the Bitterroot, Lolo, and Selway Forests. Although several short flurries of bad fire weather occurred, with relative humidities below 25% and as low as 18% in Missoula, there was little danger from fire. Missoula experienced its first April since 1925 with more than normal (1.05") rainfall. Priest River reported a record-breaking total of 3.63" against a normal of 1.93" and a previous maximum of 3.59", which occurred in 1922.

Jemison left to complete the spring overhauling of instruments at Priest River and to begin measurements of all factors of fire danger after May 1. The record-breaking snow depth of the past winter also broke nearly all of our half-inch wood cylinders which had been left as usual on their supports 12 inches above the ground throughout the winter. To avoid this loss in the future it may be necessary to place these cylinders on the ground, fully supported along their entire length, at the termination of daily measurements each fall. It is important that these cylinders be left exposed during the winter so that they will show in the spring the true effects of winter snows and rains.

The idea of "rain maps", proposed by the Experiment Station as a better method of knowing what areas on a Forest have been skipped by local rains and are therefore in most need of protection, appears to have been well received by the Forests, practically all of them placing orders for many more of the $1.00 Forest Service rain gauges. The previous number of 92 gauges in north Idaho and western Montana is expected to be more than doubled as a result of this action. Entirely aside from this current value in localizing fire danger, the resultant measurements are certain to be of use in improving the weather forecasts and as basic information concerning the true total of summer precipitation received by this large area.

After a very interesting session attended by Stockdale, Jefferson, Watts and Gisborne, the fire danger meter was modified in several respects and 300 copies have been ordered printed in Ogden, to be assembled here. The Region appreciates the two-edged possibilities of this device, but also recognizes the great financial and other benefits inherent in a uniform and scientific appraisal of fire danger. If the meter works satisfactorily it will place Region One on a scientific basis of danger appraisal and expenditure of presuppression funds. Each case of expansion or contraction of the forest protective organization will be based upon uniform and weighted consideration of each of the six factors deemed to be most important.

Analysis of the Fire Records

Completion of the first report on the analysis of the fire records for 1921-30 was delayed. It probably will not be possible to have the rough draft completed before July. To partially offset this delay, copies of eleven summary tables of results were distributed without textual material. These tables compare action by Forests and show conditions by timber and

fuel types, which clearly indicate opportunities for improvement as well as where good practices are now in effect.

After many delays, the machine summaries of the fire reports for 1931 are now being tabulated on sheets A to M. The material saving in this method is now becoming apparent when one clerk can in two days complete Sheet F, covering both discovery time and report time for all 20 Forests; or sheet G, including both get-away and travel; or sheet H, discovery-to-arrival and origin-to-began-work; or sheet I, corral time and searching time. How many man-days were required when this work was done by the Forests can be only estimated, but if each Forest used one-half a man-day for each of these sheets - and it is doubted if this work could be done accurately by hand in that time - then the saving amounts to 32 man-days for these four sheets alone. While this saving might be charged against the coding, experience in Regions One, Four and Five has shown that the coding is going to be done anyway because sheets A to M do not contain the information needed in developing the man-power placement and facilities for a Region. Hence, the 32 man-days are an actual net saving which becomes more nearly two or three man-months when all the sheets compiled from the punch cards are considered.

Selective Logging

The final report for the Anaconda Copper Mining relogging study gives a complete history of carrying charges and timber production of a 640-acre tract logged in 1887, relogged in 1927, and a prediction of cut in 1967. The conclusions drawn from this study are interesting:

1. The residual stand after the cutting of 1887 produced new stull and sawlog material at the rate of 47 board feet log scale per acre per year. This was worth $3.00 per M in 1927. The financial increment per acre per year of new wood valued at $3.00 per M was then 14¢. Besides this, there was an additional annual financial increment contained in the residual stand of 1887 which cruised 2270 feet of trees 8 inches in d.b.h. and larger in 1887. This volume had no value at that time, but by 1927 the trees had grown to merchantable size valued at $3.00 per M so they were also logged in 1927. Twenty-two hundred seventy feet prorated over the 40-year period show an additional annual financial increment per acre of 17¢. The total financial increment for the 40-year period is then 17¢ + 14¢, or 31¢ per acre per year.

2. Economic selective cutting of ponderosa pine on private lands compared to clean cutting is sound from both a silvicultural and a financial standpoint. The logging of 4120 feet in 1927 and the excellent residual stand remaining are proof of this statement.

The area logged on Revais Creek on the Flathead Indian Reservation during the last 2 or 3 years of the Polleys Lumber Company's logging (1928, 1929, 1930) compares quite favorably to the Anaconda Copper Mining study area as it was in 1887 after the original logging. A cruise of this area on Revais Creek shows a residual stand of 2090 feet per acre, or 180 feet

less than remained on the study area after the first cutting in 1887. Portions of the Montana Logging Company's cutover area on Lynch Creek also contain a residual stand of not less than 2000 feet.

3. Taxes on cutover lands in western Montana are not confiscatory if the tax history of the study area is typical.

4. Taxes on the study area, while classified as cutover timber land, did not constitute an unfair economic burden during the 30-year period. They averaged 7.9¢ per acre per year. Had the area been clean cut and broadcast burned in 1887, it could not have sustained an annual tax charge of 5¢ per acre nor could it have paid the additional charges for protection and administration.

5. The average ponderosa pine tree grew 4.1 inches in diameter between 1887 and 1927, or at the rate of 1.03 inches per decade.

Stumpage Prices

Anderson completed the final report on this project which shows stumpage prices prevailing in the Inland Empire for the past 20 years. About 50 copies of this report will be circulated to interested parties in the Region. Certain species show quite definite price trends or levels during this period.

Lodgepole pine, considered as more or less of a weed species in western Montana and north Idaho, has maintained a maximum price of around $4.00 per M in Forest Service sales east of the Continental Divide since 1912. During 13 out of the 20 years from 1912 to 1931 the average annual stumpage price of lodgepole pine for all agencies was greater than the average price of ponderosa pine.

Cedar is another outstanding species possessing "dark-horse" values. Cedar saw-timber ordinarily carries very little, if any, value and usually sells for 50¢ per M and seldom for over $1.00 per M. However, when sold as cedar poles, the rate on a log scale basis has reached the spectacular figure of $21.00 per M in one Forest Service sale in 1930. This was at the rate of 6.3¢ per linear foot for poles 30 feet and over in length and exclusive of slash disposal costs. Forest Service sales of cedar pole stumpage are usually at the rate of $8.00 per M or more when figured on a sawlog basis.

Silviculture

Weidman and Thompson devoted some attention to arboretum and model plantation work. Six blocks of an acre each were planted in the arboretum to Pinus strobus, P. monticola, P. ponderosa, P. banksiana, P. sylvestris and Picea excelsa. In addition, about 10,000 ponderosa pines were set out in two small plantations.

Census

As compared with 1930, returns from mills cutting 5000 M feet and upward in 1931 showed marked curtailment of production amounting to 38.6 per cent for Idaho and 46.4 per cent for Montana.

The following statement compares the output of identical mills which produced approximately 88 per cent of the aggregate cut for the two states in 1930:

State	No. of Mills	Lumber Cut (M Feet Board Measure) 1930	1931
Montana	8	248,035	133,006
Idaho	21	752,685	461,789
	29	1,000,720	594,795

A number of the mills included in a comparative statement of this kind last year were idle during 1931.

Range Research

Field work on the range research project at Miles City, Montana, started early in April. The first job is that of fencing a series of pastures and drilling wells to provide stock water for each pasture. The plan as approved by the Forest Service and the Bureau of Animal Industry calls for six summer pastures, six winter pastures, and two yearlong pastures. Three degrees of stocking will be used, as follows: 125%, 100% and 75% of the estimated carrying capacity; and the experiment will be run in duplicate to insure more reliable results. Eighty head of two-year-old heifers have been selected for the experiment, to be used for a period of several years. Thus we will be able to determine the cumulative as well as the annual effect of the degree of stocking on both stock and vegetation.

Some work is being started with artificial regeneration of depleted ranges by sowing crested wheat grass and slender brome grass.

Manufacturing Costs

Data collected by Neff and Bradner on the recent trip to Inland Empire sawmills show the total cut in the band mills visited to be 613 million feet in 1931 as compared to 1000 million feet in 1930. Six band mills that have operated for the last 5-10 years did not turn a wheel in 1931. Though there has been a curtailment in all species cut, the reduction in some species has been much heavier than in others. The production of western (Idaho) white pine lumber was reduced 23 per cent in 1931 over 1930; ponderosa pine, 60 per cent; and mixed species, 65 per cent.

The cost of manufacturing lumber in the band mills of the Inland Empire region was slightly lower in 1931 than in 1930. The following tabulation compares the weighted average cost of manufacture for all mills - 1930 and 1931:

	1930	1931
Pond to Pile	$ 3.43	$ 3.08
Kiln Drying	0.76	0.71
Pile to Car	4.90	4.76
Overhead	3.29	3.60
	$12.38 per M	$12.15 per M

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

Experimental Forests and Natural Areas Committee held one meeting during the month at which the North Fork Nooksack Natural Area, typical of the northern Cascade cedar-hemlock-fir climax type, was approved and also the Ochoco Divide Natural Area, typical of the ponderosa pine and north slope types of the Blue Mountains. Other areas were discussed and listed for examination this season.

Other Stations may be interested to know that after considerable discussion of methods, we have marked our metallic instrumental equipment with an electric pencil, which was bought for $3.00 for the purpose. Marking levels, compasses, tapes, cameras, etc., can be done this way very rapidly, and we think it a good insurance against theft, loss and mixing up of equipment.

Forest Insurance

The early part of April was devoted to a study of the forest conflagration hazard in the Douglas fir region and its possible effect on forest fire underwriting and rating with the idea of attempting to determine practical methods of providing proper reserves to meet probable future requirements. The problem of the proper allowance and handling of a reserve for this contingency is a difficult one and the proposed method should be defensible on some logical basis. This study is directed toward as thorough an investigation of conflagration possibilities as it is possible to make in order that suggestions may be reasonably authoritative. A preliminary report on the subject has been written.

Inquiry was made into the peculiarities of loss adjustment practice as they will likely apply in forest insurance and a report written in which the attempt is made to cover the points that will require chief attention.

New Public Domain

Numerous additional contacts have been made since the last report and reception of the project has been cordial on the part of state and county officials, chambers of commerce, and business men in general. Volunteer cooperating committees have been set up in Seattle, Pullman and Corvallis, and are at work.

To more definitely outline procedure, Mr. Wilson with two assistants initiated work in Columbia County, Oregon, by setting up school and road districts, outlining reforestation areas, entering delinquency data on township plats and compiling sample statistical data. Mapping delinquency for the county as a unit is now under way. A progress report on a selected area is also in course of preparation.

Section of Forest Products

A considerable portion of the staff time was given over to planning projects listed for the coming field season.

Douglas Fir Mill Scale Studies - In response to the desire expressed at the recent Investigative Committee Meeting, Lodewick and Johnson spent four days visiting various Douglas fir operations in the Willamette Valley and Columbia River regions in an endeavor to line up some mills that would lend themselves to a mill scale study. Necessary forms for these studies have been prepared. Tentative arrangements were made at two mills with the idea of starting the studies about May 15.

Logging Time Studies in Ponderosa Pine - Lodewick and Rapraeger spent eight days in eastern Oregon contacting ponderosa pine operators and investigating the possibilities of selective logging studies to be carried on during the summer.

Logs, Lumber, and Other Timber Products Census - Most of Johnson's time was given over to the 1931 census work, editing schedules and securing additional information in the case of incomplete returns. During the month 247 fourth requests were sent out. To date 1,463 completed schedules have been sent to Washington, 518 during April. Also five days were spent in the field in Oregon picking up delinquent companies.

Requirements Phase of Survey - Additional time has been devoted to the requirements phase of the Survey. Available published building permit summaries have been obtained and analyzed, thus clearing the way for detailed analyses of the Portland permits. Mr. Griffee of Corvallis, a graduate forester formerly with the National Lumber Manufacturer's Association, has been appointed field assistant to make these analyses and reports for duty on May 1.

Mensuration

Meyer checked the application of plot material to extensive stand conditions in the yield study of ponderosa pine. Since site, reserve volume, and percentage of tree class representation are taken care of in the method of prediction, it remains to be proven that the spacing of trees and the average degree of release are comparable between plots and extensive stands. The release of a tree is tentatively measured by the distance to the nearest exposed stump. Stand maps procured for several hundred acres of strip in virgin and cut-over stands permit this calculation. The chief difference between plots and stands lies in the groups of unthinned bull pine which occur in many areas but which are insufficiently represented by the plots. Increasing the reserve stand from approximately 20 per cent to 65 per cent changes the average release condition to no determinable extent.

Silviculture

Wind River Arboretum - Early in the month 27 new lots of conifers comprising 310 specimens were outplanted in the Arboretum.

This year marks the twentieth anniversary of the Arboretum. There are now 106 different coniferous species growing there, of which 41 are pine. The balsam fir group has 13 different species, the spruce 12, and the larch and juniper groups both have 7 species. In addition to the conifers there are 39 species and varieties of hardwoods. In all there are over 2000 trees on the 8-acre area. The transplants in the Arboretum nursery number 1025 trees divided into 60 lots.

Methods of Cutting in Ponderosa Pine - Work was begun this month on an economic analysis of various methods of cutting in ponderosa pine. The purpose of this analysis is to show the long time economics of various intensities of cutting, which, coupled with the findings of silvicultural research, will point the way to the soundest methods of sustained yield ponderosa pine management, both under public and private ownership.

Douglas Fir Natural Reproduction - The groups of semipermanent Douglas fir cut-over plots, which Isaac has been examining since 1926, are now furnishing some interesting results. One particular area presents a striking example of how reproduction is retarded by slash burning. It was cut in 1924 following a heavy (1923) seed crop, and early in 1925 part of the area was burned. Seedlings occurred immediately on the unburned part of the tract, but none on the burned. Early in 1929 a second fire swept the country side. The inflammable material on the burned surface consisted of 4 years' accumulation of dead bracken and other herbaceous material that dried out very quickly while the more brushy unburned surface remained moist. As a result the burned surface reburned and the unburned part escaped the second fire. In 1931 a few seedlings occurred on the burned area, averaging about 10 to the acre, while the unburned area now supports a stand of 1500 well-established seedlings to the acre, the tallest of which are six feet in height.

Fire Studies

Attack - Hour control analyses were completed for all west side forests and analyses also were completed for two groups of these forests. Charts for all of these analyses have been prepared. This study is now practically completed. Considerable work was done on visibility studies: (1) Analyzing records taken by 14 lookouts in connection with the "target visibility" phase of the study, and (2) a complete analysis of the smoke detection tests made on 4 forests last summer.

Behavior - Maps of lightning storm occurrence and behavior were sent to the Washington office of the Weather Bureau for Mr. Stevens' use in his studies of ways to improve lightning storm prediction. The supplemental analysis of lightning fires was nearly completed.

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SOUTHERN FOREST EXPERIMENT STATION

Naval Stores

Wyman reports that the results of the 1926-1930 tests of types of streaks carried on at Starke have been compiled. The slash pine experiments bear out the conclusions reached in the first series which ran from 1923-1930. At the end of five years' time there is less than 3 per cent difference in the total yields of naval stores from 1/4 inch, 1/2 inch, and 3/4 inch height of streaks. The two narrower streaks were used for another year with substantial returns whereas the 3/4 inch chipping exhausted the tree in five years. There is no reasonable doubt that the highest naval stores yields will be derived from streaks .25 to .3 inch high although some winter chipping, jump streaks or wide streaks in the earlier spring may be needed to cut out the gum soaked wood which has formed during the winter.

The conclusion reached in the longleaf height of streak test is that the greatest naval stores yields are obtained with 1/2 inch chipping, although one set of experiments run for two years only gave greater yields from 1/4 inch streaks. Another test by Miss Gerry also gave slightly higher yields from narrower streaks but by weighting tests in proportion to the number of trees in the test the yield from narrow work was 10 to 11 per cent less than from 1/2 or 3/4 inch chipping. There is perhaps some variation in the response of different bodies of longleaf pine to variations in streak height but chipping much under 5/10 inch in height may reduce yields. This loss of course is made up by the longer working period possible with lower chipping.

An analysis of the effect of a prolonged drought on oleoresin yields prepared by Liefeld and based on chipping frequency trees indicated little, if any, effect on longleaf timber during a drought which began in August and lasted until December. In January and February, with continued dry weather, the yields were reduced to a marked degree.

The first dipping for 1932 showed a sharp drop in yields from slash pine below the 1931 first dip figures. This difference is attributed to the severe effect of drought. The same effect did not show up in longleaf growing on a naturally drier site which was not chipped until after the first rains had broken the dry spell.

Erosion

Meginnis, Olsen and Maki, finished the 1932 erosion control plantings at Holly Springs, Mississippi. The species planted were loblolly, shortleaf, Austrian and western yellow pines, black locust, red river oak, catalpa, cottonwood and mimosa. A total of about 7000 trees were planted. Carefully graded stock was used and tests made of grades, planting methods and classes of stock. Pine transplants (1-1) were favored this year over 1-0 stock although some of the latter were used. Black locust wild seedlings and root cuttings were used along with 3 grades of the 1-0 nursery seedlings. In addition to the tree plantings, vines and other plants were set out in gullies and washes either as a preparatory erosion control measure or in combination with the tree plantings. Kudza bean, Japanese honeysuckle, several native leguminous vines, Japanese clover (Lespedeza striata), bermuda and centipede grasses were planted. Various types of soil-saving dams were also established. These were made of brush, bermuda grass sod or vine netting and such reinforcements as cottonwood cuttings, grass sod, honeysuckle, etc., were employed.

Believe It or Not, By Wakeley

Wakeley has completed the year's plantation reexaminations at Bogalusa. He reports the tallest longleaf pine in our own plantations measures 15 feet, 3 inches high after 7 years in the field and 8 from seed. In the loblolly spacing plantations, now 9 years in the field and 10 from seed, many trees are now 25 feet tall and 4 inches d.b.h.; a few approach 30 feet and 5 inches in size.

Dipping for Stain Control in Lumber

Preliminary small scale tests of new dipping treatments were conducted by Dale Chapman. The tests at Oakdale and Mab, Louisiana, were completed, and others at Chapman, Alabama, and Gloster and Natchez, Mississippi are now under way. In addition to determining the effectiveness of several new compounds in stain control, special attention is being paid to their permanence and efficiency in preventing decay occurrence, with a view towards obtaining treatments valuable not only for temporary protection on the lumber seasoning yard, but also with respect to more permanent preservation both of lumber and of poles and piling.

A conference with Mr. Mills of the Dow Chemical Company of Midland, Michigan, indicated that if their phenol compounds continue to show promise as stain preventives, they will start an active marketing program within a few months. The technical phases of the application of their treatments were discussed in detail, and several problems relating to their improvement were outlined to him for study in their laboratory.

Conferences along the same general lines were held with Mr. R. M. Curts of the American Potash and Chemical Company, and Mr. Leavitt of the Protection Products Company of Kalamazoo, Michigan.

Brown Spot Disease

In the spring of 1928, Wakeley laid out five plots in a recently burned area of dense natural longleaf reproduction located near Bogalusa, Louisiana. The original purpose was to secure information on the relation of fire to the brown-spot needle blight of longleaf. Siggers has made annual estimates in the spring of the amounts of dead needle tissue caused by the disease. The following table shows the average amount of dead needle tissue by plots based on individual examination of several hundred seedlings.

	Foliage of		
Plot No.	1929	1930	1931
1	82	65	82
2	67	39	65
3	46	29	56
4	63	54	95
5	61	41	67

These figures show the relationship between the disease and local climate. The very dry season of 1930 resulted in a general reduction in disease in all plots. The season of 1931 brought about a definite increase in disease among three plots. This is thought to have been due to the very mild winter of 1931-32 which permitted the fungus to develop at an unusually rapid rate. Some of the seedlings, particularly in Plot No. 1, have reached a height where the amount of infection is reduced, but the figures do not indicate this condition because they are based on average estimates of seedlings which are for the most part still in the stage of severe needle infection.

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

The Southwestern Station welcomes Wilson H. Beveridge, who transfers from the Lincoln National Forest. Mr. Beveridge attended the Iowa State College 1925 to 1929 inclusive, graduating with a B. S. degree in forestry. Previous experience includes grazing reconnaissance in Region Four and timber sale and timber surveys on the Sitgreaves and Lincoln National Forests in Region Three. In his new assignment Mr. Beveridge will work on the project "Range management in the ponderosa pine type" with Messrs. Cassidy and Merrick

The Jornada Experimental Range through the efforts of Ares now has a very attractive set of signs at various study plots, mounted on iron posts, the board backing for the metal sign and the post being painted white.

Water storage in the four reservoirs on Salt River (1,405,752 acre feet on April 21) now surpasses the previous all time record by several thousand acre feet. Total capacity has been enlarged since the first record was established bringing it up to 1,895,720 acre feet. Roosevelt Lake is two-thirds full and presents and entirely new shore line to that of 1930 and 1931.

Construction work on the Parker Creek Experimental Forest is progressing rapidly. One dwelling house and a garage have been completed. The foundation for the second dwelling is in; lumber and materials for house construction are on the ground. Plans for a third house have been completed. Work will be started in a short time on the water supply, pipe line, sewer lines, etc.

An unusually severe winter has left its impress on the forest in the Flagstaff section. Ponderosa pine has suffered much from browning of foliage in exposed situations; junipers which had ventured into the lower edge of the ponderosa pine type are generally winter killed. Arizona cypress, Chihuahua pine, and California big tree in the unheated greenhouse at Fort Valley were badly winter killed, whereas Apache pine, ponderosa pine, Douglas fir and Engelmann spruce suffered but little. Ponderosa pine seedlings in the open show little damage, evidently because they were covered by snow during most of the winter.

Jornada Clipping Study

The data collected on the Black Grama Study indicate that the clipping of all the stems of a black grama plot at either 1 or 2 inches above the ground is detrimental to the plant regardless of whether the clipping is made at intervals during the period of growth or is made once each year at the end of the growing season. In general, the forage production in grams per unit of area has decreased and the density has diminished on all clipped black grama quadrats with each succeeding season of clipping. No reproduction has occurred since 1928 and no new plants which have made their appearance on any clipped quadrat since the establishment of the study have survived.

Density Losses on Clipped Black Grama Quadrats

	QUADRAT #1 Clipped at 2 Wks. Intervals	QUADRAT #2 Clipped at 4 Wks. Intervals	QUADRAT #3 Clipped at 6 Wks. Intervals	QUADRAT #4 Clipped at End of Season only
Density losses on quadrats clipped at 2 inches for 7 years	54.8%	45.1%	35.3%	36.6%
Density losses on quadrats clipped at 1 inch for 6 years	85.1%	66.0%	66.6%	66.0%

Forage Production on Clipped Black Grama Quadrats

	QUADRAT #1 Clipped at 2 Wks. Intervals		QUADRAT #2 Clipped at 4 Wks. Intervals		QUADRAT #3 Clipped at 6 Wks. Intervals		QUADRAT #4 Clipped at End of Season Only	
	Production in Grams		Production in Grams		Production in Grams		Production in Grams	
	Total	Per Sq.Cm.	Total	Per Sq.Cm.	Total	Per Sq.Cm.	Total	Per Sq.Cm.
Total and Average Production per unit of tuft area on quadrats clipped at 2 inches	173.38	0.0160	172.84	0.0167	232.36	0.0241	228.51	0.0250
Total and average production per unit of tuft area on quadrats clipped at 1 inch	115.64	0.0197	140.13	0.0244	110.99	0.0228	111.84	0.0275

All the data obtained indicate that clipping of black grama at either 1 or 2 inches is serious over-utilization when all the stems are removed from the plant. The data secured on the tobosa clipping study are less conclusive. The density has increased enormously on all clipped quadrats since the beginning of clipping 7 years ago. However, the productivity per unit of area, and in most instances per quadrat has been lowered. Also there are indications that the quadrats clipped at a height of two inches are beginning to lose tuft area through the death of the smaller tufts and of parts of the larger specimens.

Black grama and tobosa grass react differently to the same intensities of clipping. The black grama clipped at 2 inches loses practically all of its leaves in the operation, while the tobosa has a profusion of basal foliage which is for the most part left unimpaired by the clipping. This difference in the habits of growth explains the heavier losses incurred on the black grama quadrats under close clipping.

Volume Tables

Hornibrook spent the major portion of the winter transferring eight ponderosa pine volume tables to alinement charts in order to facilitate sample plot computations. Considerable difficulty was encountered in attempting to represent the very peculiar surfaces of the old tables by an alinement chart. This difficulty was finally traced to the poor harmonization of the original tables, and brought out quite forcibly the advantage of the new volume table technique. The alinement chart table agreed very closely with the old table when the data were numerous, but showed considerable discrepancy at the extremes of the tables.

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MANUSCRIPTS

Allegheny

"Converting Factors for Some Stacked Cords" by G. Luther Schnur
(For Jour. of For.)

"Virgin Forest in Pennsylvania Yields Research Results" by A. F. Hough
(For Yearbook)

Lake States

"Observations on Drought Injury in Minnesota Forests" by Hardy Shirley
(For Ecology)

Southern

"Notes on the Root System of Longleaf Pine on the Deep Sands of Western Florida" by Frank Heyward.
(For Ecology)

Pacific Northwest

Tentative Working Plan for Fire Damage Studies, by Donald Matthews,
(Fire Depletion Phase for Forest Survey)

"Light Burning" (Memo. for Regional Forester) by Donald Matthews.

Descriptive Memoranda for Forest Survey Field Work and General Conditions in Island County, Wash., by F. L. Moravets.

Descriptive Memoranda for Forest Survey Field Work and General Conditions in San Juan County, Wash., by F. L. Moravets.

Southwestern

"The Occurrence of Gutierrezia species in Bantelona Ranges in Southern New Mexico" by R. S. Campbell and E. H. Bomberger

"Timber Growing and Logging Practice in the Southwest and in the Black Hills Region" G. A. Pearson and R. E. Marsh.

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IN PRINT

Forsling, C. L. "Erosion on Uncultivated Lands in the Inter-mountain Region." (Scientific Monthly, March, 1932.)

Jemison, George M. "Meteorological Conditions Affecting the Freeman Lake, Idaho, Fire." (Mo. Wea. Rev, January, 1932)

Lodewick, J. Elton "Inventory of Sawmill Waste and Its Present Utilization." (The Timberman, April, 1932.)

McArdle, R. E. "The Relation of Mycorrhizae to Conifer Seedlings." (J.A.R. Feb. 15, 1932.)

Munger, T. T. "What is Selective Logging?" (West Coast Lumberman, March, 1932.)

Osborne, W. B. Jr. "Forest Fire Equipment Developments." (The Timberman, March, 1932.)

Spaulding, Perley "Pre-eradication scouting - stop, look and listen." Rept. Proc. 17th Ann. Blister Rust Control Conference, Oct. 29-31, 1931, pp. 27-28, 1932.

Spaulding, Perley and J. R. Hansbrough "The sweet-fern blister rust of pitch pines." U. S. Dept. Agr. Cir. 217.

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